

16 July 1969

Matériel Test Procedure 10-4-004
U. S. Army Arctic Test Center

U. S. ARMY TEST AND EVALUATION COMMAND
ENVIRONMENTAL TEST PROCEDURES

ARCTIC ENVIRONMENTAL TEST OF RATIONS

OBJECTIVE

The object of the procedures outlined in this MTP is to provide a means of evaluating the acceptability of rations in arctic winter environmental conditions.

BACKGROUND

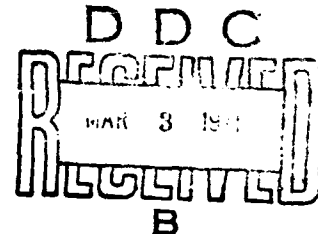
Engineering tests are conducted to determine the characteristics and acceptability of materials under various operational conditions and to ensure their compliance with specified requirements. Testing in a natural arctic winter environment provides data to substantiate or supplement data obtained from simulated environmental tests conducted during the Engineering Design and Engineering Test Phase. Testing in the arctic winter environment is generally not authorized until data from simulated environmental tests provides reasonable assurance that the test item will function satisfactorily when subjected to the conditions that would be encountered in the arctic.

3. REQUIRED EQUIPMENT

- a. Appropriate arctic winter uniforms.
- b. Weapons.
- c. Ammunition.
- d. Vehicles (cargo)
- e. Support aircraft.
- f. Drop zone.
- g. Parachutists adjustable individual equipment containers.
- h. Skis and snowshoes as required.
- i. General and special tools and other ancillary items required for evaluation or maintenance on the test item.
- j. Test equipment.
- k. Photographic equipment (black and white or color).
- l. Meteorological support instrumentation.

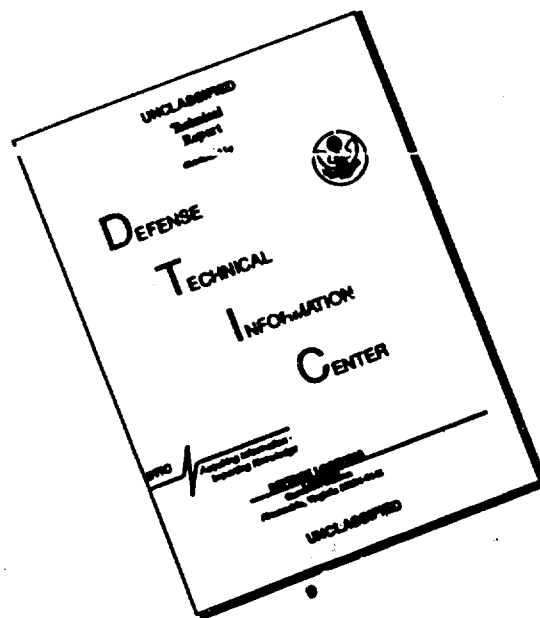
4. REFERENCES

- A. AR 70-8, Human Factors and Social Sciences Research.
- B. AR 70-10, Army Materiel Testing.
- C. AR 705-5, Army Research and Development.
- D. AR 750-6, Maintenance Support Planning.
- E. AR 705-15, Operation of Materiel Under Extreme Conditions of Environment.
- F. USATECOM Regulation 350-6, Training in New or Modified Equipment and training devices.
- G. USATECOM Regulation 705-2, Documenting Test Plans and Reports.
- H. FM 31-70, Basic Cold Weather Manual.



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- I. MTP 10-4-500, Arctic Preoperational Inspection, Physical Characteristics, Human Factors, Safety and Maintenance Evaluation
- J. MTP 10-2-040, Combat Rations.

5. SCOPE

5.1 SUMMARY

The procedures outlined in this MTP are designed to determine and evaluate the acceptability of rations in arctic environmental conditions. Specific subtests include:

a. Preoperational Inspection and Physical Characteristics - The objective of this subtest is to determine:

- 1) If the test and support items are in proper condition for testing.
- 2) If the test rations physical characteristics conform to the applicable criteria.

b. Acceptability - The objective of this subtest is to determine the acceptability of the test rations when consumed by test personnel living in the field and participating in field exercises under arctic winter conditions.

c. Portability - The objective of this subtest is to determine the ease of carrying the test rations in the soldier's clothing and rucksack while participating in ski, snowshoe and vehicular marches.

d. Aerial Delivery - The objective of this subtest is to determine the suitability of test rations for parachute operations under arctic winter conditions.

e. Storage - The objective of this subtest is to determine whether test rations can be stored under arctic environmental conditions.

f. Human Factors Evaluation and Safety - The objective of this subtest is to determine the effectiveness of human factors aspects of rations.

g. Maintenance Evaluation - The objective of this subtest is to determine the maintenance requirements for the test rations, by their use in an arctic environment, and to determine whether these test ration maintenance requirements meet maintenance and maintainability standards as defined by QMR's, TC's, SDR's, or other established criteria. In addition, a reliability study shall be made to determine whether the test rations, as packed, are reliable without continuous maintenance.

5.2 LIMITATIONS

The procedures described in this MTP are limited to the testing of rations under arctic environmental conditions. Procedures for testing combat rations are described in MTP 10-2-040.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Since arctic winter environmental tests are normally scheduled from October through March (6 months), ensure that the test and comparison weapons are delivered to the Arctic Test Center prior to 1 October.

b. TDY personnel shall be used to augment assigned personnel and shall be trained to the degree that they are as proficient on the individual weapons as the troops who will use the weapon.

c. Ensure that all test personnel are familiar with the required physical, technical and operational characteristics of the item under test, such as stipulated in Qualitative Material Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC), and record this criteria in the test plan.

d. Review all instructional material issued with the test item by the manufacturer, contractor, or government, as well as reports of previous tests conducted on the same type of rations and familiarize all test personnel available for reference.

e. Record the grade, MOS, background, and training of all test personnel and ensure that all personnel receive new equipment training (NET) as referenced in 4F.

f. Record the following information:

- 1) Nomenclature, serial number(s), and manufacturer's name of the test rations.
- 2) Nomenclature, serial number(s), accuracy tolerances, calibration requirements, and last date calibrated of the test equipment selected for the tests.
- 3) Date rations were packed.

g. Select test equipment ideally having an accuracy 10 times greater than that of the function to be measured.

h. Prepare record forms for systematic entry of data, chronology of tests, and analysis in final evaluation.

i. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOP's are observed throughout the test. Ensure that a Safety Release has been obtained prior to test conduct.

j. Outfit all test personnel in appropriate arctic winter clothing as described in MTP 10-4-500, and with individual field equipment, during all weapon testing.

k. Ensure that when not in use, all test and comparison weapons are stored and maintained in an unsheltered area and exposed to ambient air temperature and prevailing weather conditions.

l. Record the prevailing meteorological conditions during the storage phase, as well as test conduct, to include:

- 1) Temperature
- 2) Humidity, relative or absolute
- 3) Temperature gradient
- 4) Atmospheric pressure
- 5) Precipitation
- 6) Solar radiation
- 7) Wind speed and direction

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- 8) Frequency of readings
- 9) Source of data

m. Perform the necessary calibration of the detection device(s).

6.2 TEST CONDUCT

6.2.1 Preoperational Inspection and Physical Characteristics

- a. Upon receipt, carefully inspect all test rations and their shipping or packaging containers for completeness, damage, and general conditions in accordance with applicable sections of MTP 10-4-500.
- b. In addition to a above, select 10 percent of the test rations at random.
- c. Inspect rations (contents, over-package, shipping case) from exercise b above to determine defects in manufacturing and damage in shipping or handling.
- d. Identify each component of the test rations with a code number.
- e. Weigh and measure ten of each component of the rations and record the results.
- f. Complete the packaging failures and effects of freezing form (Appendix E).

6.2.2 Acceptability

- NOTE:
- 1. Prior to the conduct of any testing procedures, each test soldier shall be given a physical examination by a medical officer to determine his overall physical condition. This examination shall include weighing each soldier without clothing immediately before and after each field exercise.
 - 2. The medical officer and test observers shall record any significant changes in the physical condition or weight of each soldier.

- a. Issue a three (3) day test ration kit to each soldier at the beginning of each field exercise.
- b. Direct each test soldier to carry the test rations on his person, in his rucksack or on an ahkio.

NOTE: No food other than the test rations shall be available to the soldiers.

- c. Direct the platoon to participate in four field exercises, eat and sleep in the field under arctic winter conditions.
- d. Instruct each soldier of an Infantry platoon to subsist on the test rations at the rate of one test ration per day for a period of four (4) consecutive days.
- e. Advise soldiers that all components of the test rations may be consumed heated or unheated.

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- f. Inform soldiers to have at least one unheated meal each day.
- g. Distribute the rations so that a soldier will not receive the same menu two times consecutively within any four (4) day period.
- h. Complete the food rating form Appendix A after consuming each test meal.
- i. Complete the final acceptability form Appendix B at the end of each field exercise and at the end of the test.
- j. Record the following data:
 - 1) Ambient air temperature
 - 2) Weight of all test personnel

6.2.3 Portability

NOTE: Ensure that a minimum of five percent of the test rations in their shipping containers or cases (if provided) are carried and/or transported in or on packboards or packframes, in ahkios wherever applicable.

- a. Direct test personnel to accomplish the following:
 - 1) Utilizing snowshoes, march 16 miles through dense, snow-covered brush.
 - 2) Utilizing snowshoes, march 12 miles over snow-covered (cross-country) terrain.
 - 3) Ski 100 miles over cross-country ski trails.
 - 4) Transport test rations 100 miles cross-country in tracked vehicles.
 - 5) Transport test rations 100 miles on secondary roads in wheeled vehicles.
 - 6) Utilizing test rations conduct four 4-day field training exercises consisting of attack, defense, patrolling and retrograde operations which will require individual soldiers of the squad to use all TO & E equipment as well as special equipment issued for use under arctic winter conditions.
 - 7) Test personnel shall carry the test ration groups in the following manner during the 4-day field exercise.

<u>Squad</u>	<u>Number of Ration (Group)</u>	<u>How Carried</u>
1st	1	In Clothing
2nd	2	In Clothing
3rd	3	In Clothing & Rucksack
4th	4	In Clothing & Rucksack

- a) One half of each squad shall carry test rations as complete menu cartons.
- b) One half of each squad shall carry test rations separated into individual components.
 - 1) Repeat a and b each day.

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- c) New test rations shall be issued each day.
- d) Collect and hold previous days test rations for inspection.

8. At the end of the field exercise, collect all test rations.

- a. Inspect all test rations which have been collected, for packaging failures and effects of freezing on components of the test rations.
- b. At the end of the field training exercise, test personnel shall complete packaging failures and effects of freezing form as applicable Appendix E.
- c. At the end of Portability Subtest, test personnel shall complete portability questionnaire form Appendix C.
- d. At the end of this subtest, test personnel shall complete test officer's report form Appendix D.
- e. Subject the test items to the applicable sections of MTP 10-2-040, Combat Rations and record the following:
 - 1) Palatability.
 - 2) Nutritional evaluation and physiological effects of Consumption.
 - 3) Palletization.
 - 4) Chemical, biological and radiological effects.
 - 5) Food preparation and equipment evaluation.

6.2.4 Aerial Delivery

- a. Inspect each test ration before each jump. NOTE any deficiencies in the test log.
- b. Direct test personnel (parachutists) to store test rations in their clothing and/or equipment.
- c. Instruct parachutists to make a minimum of three jumps with the test rations.
- d. Direct a qualified rigger to rig five percent of the test rations for a free-fall airdrop.
- e. Drop the five percent of test rations, as rigged in exercise d above, from an altitude of 100 feet.
- f. Direct a qualified rigger to rig five percent of the test rations for a low velocity airdrop.
- g. Direct a qualified rigger to rig five percent of the test rations for a high velocity airdrop.
- h. Instruct rigger to airdrop test rations at both velocities.
- i. Inspect test rations after each airdrop and jump.
- j. Complete airdrop evaluation form Appendix F (Bundle Data).
- k. Complete airdrop evaluation form Appendix G (Case and Menu Carton Data).
- l. Complete airdrop evaluation form Appendix H (Parachutist Data).
- m. Record the following data:
 - 1) Results of pre and post jump inspection.
 - 2) Ambient air temperature.

- 3) Malfunctions of test items.
- 4) Altitude, speed and type of delivery aircraft.

6.2.5 Storage

- a. Store ten percent of the test rations outdoors and exposed to the prevailing weather conditions for a minimum of 45 days.
- b. Inspect the items to be stored before and after exposure for effects of storage under arctic winter conditions.
- c. Complete test officer's report form Appendix D.
- d. Complete food rating form Appendix A.

6.2.6 Human Factors Evaluation and Safety

- a. Conduct all Human Factors and Safety tests in accordance with the applicable sections of MTP 10-4-500.
- b. Conduct these tests concurrently with the operational tests described in this MTP.
- c. Observe any difficulties and discomforts encountered with the test rations.
- d. Complete portability questionnaire Appendix C.
- e. Complete test officer's report form Appendix D.

6.2.7 Maintenance Evaluation

- a. Conduct all maintenance evaluation tests (maintenance and reliability) in accordance with applicable sections of MTP 10-4-500.
- b. Conduct these tests concurrently with the operational tests described in this MTP.
- c. Observe and record, during the conduct of all subtests, scheduled and unscheduled maintenance operations shall be recorded on test officer's report Appendix D.

6.3 TEST DATA

All test data to be recorded will be as specified in the individual subtests of this MTP.

6.4 DATA REDUCTION AND PRESENTATION

Processing of raw test data shall, in general, consist of organizing, marking for identification and correlation, and grouping the test data according to test title.

Specific instructions for the reduction and presentation of individual test data are outlined in the succeeding paragraphs.

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6.4.1 Pre-Operational Inspection and Physical Characteristics

a. Pre-operational inspection and physical characteristics shall be reduced and presented in accordance with MTP 10-4-500.

b. Data recorded in Pre-Operational Inspection and Physical Characteristics, paragraph, 6.2.1,e shall be computed and the average weight and measurements obtained.

6.4.2 Acceptability

a. Summarize data recorded in Acceptability, paragraph, 6.2.2, to determine the weight loss/gain per individual test soldier during test.

b. Evaluate a above and determine the average weight loss/gain per 50 test soldiers.

6.4.3 Portability

Examine the recorded data and determine the maximum and optimum number of test rations that can be carried in the soldier's clothing and ruck-sack while participating in arctic environmental exercises.

6.4.4 Aerial Delivery

The suitability of the test rations for aerial delivery under arctic winter environmental conditions shall be determined by evaluating the data obtained during airborne operations.

6.4.5 Storage

The data obtained from this subtest shall be evaluated to determine if the test rations meet storage requirements under arctic winter conditions.

6.4.6 Human Factors Evaluation and Safety

Human Factors and Safety data shall be reduced and presented in accordance with MTP 10-4-500. Evaluate data recorded in Appendix A, B and E and relate results of evaluation to how the test rations may be improved.

6.4.7 Maintenance Evaluation

Maintenance data shall be reduced and presented in accordance with MTP 10-4-500.

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GLOSSARY

1. High Velocity Air Drop (60-90 fps) - Intentional increase of rate of descent by using extraction parachutes instead of standard cargo parachutes. These drops result in a lowered cost of air delivery equipment and a better defined trajectory from the point of release.
2. Low Velocity Air Drop (28-35 fps) - Standard method of air drop used to deliver personnel, supplies, or equipment from aircraft in flight, utilizing sufficient parachute retardation to prevent injury or damage upon ground impact.

APPENDIX - A

FOOD RATING FORM

Name

Menu

Date

A. How acceptable was this particular meal? (Circle one phrase on the scale.)

B. Rate each of the following foods included in this meal by circling one phrase on the appropriate scale.

TYPE FOOD

9 - Extremely Acceptable

9 - Like
Extremely

9 - Like
Extremely

9 - Like
Extremely

8 - Very Acceptable

8 - Like
Very Much

8 - Like
Very Much

8 - Like
Very Much

7 - Moderately Acceptable

7 - Like
Moderately

7 - Like
Moderately

7 - Like
Moderately

6 - Slightly Acceptable

6 - Like
Slightly

6 - Like
Slightly

6 - Like
Slightly

5 - Neither Acceptable
Nor Unacceptable

5 - Neither
Like Nor
Dislike

5 - Neither
Like Nor
Dislike

5 - Neither
Like Nor
Dislike

4 - Slightly Unacceptable

4 - Dislike
Slightly

4 - Dislike
Slightly

4 - Dislike
Slightly

3 - Moderately Unacceptable

3 - Dislike
Moderately

3 - Dislike
Moderately

3 - Dislike
Moderately

2 - Very Unacceptable

2 - Dislike
Very Much

2 - Dislike
Very Much

2 - Dislike
Very Much

1 - Extremely Unacceptable

1 - Dislike
Extremely

1 - Dislike
Extremely

1 - Dislike
Extremely

C. Did you heat any of the components?
If yes, list items heated

Yes

No

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C. How were they heated?

E. Did you get enough to eat from the foods in this test meal? (Check one)
More than enough Enough Not enough

F. How much of the meal did you eat? All 1/2 None Other

G. Comments:

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APPENDIX - B

FINAL ACCEPTABILITY FORM

Name

Date

During the past week you have been subsisting on the test ration. Based on the general concept of its use as outlined in your initial orientation, and on your experience with the ration during this test, answer the following questions or provide comments as appropriate.

1. a. Were the various containers of the test ration easy or difficult to open? (Circle appropriate answer).

Type Container

Easy to Open Difficult to Open

- b. Explain any difficulty in opening packages.

2. a. Did you have trouble getting the foods out of the individual containers when eating? Yes No

- b. Which foods did you have trouble removing, or eating, from the containers?

3. a. Did any of the foods in the test rations make you unusually thirsty? Yes No

- b. If your answer is "yes", which foods?

4. a. Did you generally get enough to eat from one test ration per meal? (Check one)

More than enough

Not enough

Enough

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b. If your answer is other than "enough", what do you think is the smallest number of test meals the soldier should be issued each day as his only source of food when performing field duties under arctic winter conditions?

Test meals

5. Considering the intended purpose of the test ration and your experience during this test, how do you rate the overall suitability of the test ration for use by the combat soldier under arctic winter conditions? (Check one)

Very suitable

Slightly suitable

Neither suitable nor unsuitable

Slightly unsuitable

Very unsuitable

6. Record below any comments, good or bad, you wish to make about the test rations to include menus, packaging, use under arctic winter conditions and other pertinent information.

APPENDIX - C

PORTABILITY QUESTIONNAIRE

Name

Date

You were issued (number) test meals which you carried in your clothing and rucksack while performing field training under arctic winter conditions. Based on your experience in carrying the test meals, answer the following questions:

1. How many of the meals did you carry?

- a. In your pockets or otherwise in your clothing
- b. In your rucksack

2. Check below all the items of your clothing and rucksack used to carry the test meals issued to you.

FIELD JACKET:

Upper Right Pocket

Upper Left Pocket

Lower Right Pocket

Lower Left Pocket

Between Jacket and Shirt

TROUSERS:

Left Front Pocket

Right Front Pocket

Left Rear Pocket

Right Rear Pocket

Left Cargo Pocket

Right Cargo Pocket

SHIRT:

Right Pocket

Left Pocket

Between Shirt and Body

PARKA:

Right Pocket

Left Pocket

RUCKSACK

OTHER: (DESCRIBE)

3. How adequate was the space in your clothing and rucksack for carrying (number) test meals? (Check one)

More than adequate

Adequate

Not Adequate

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4. Did carrying test meals in your clothing restrict your movements?
(Check one)

Yes, a great deal

Yes, some

No, did not restrict movement

5. What type of jobs were you performing while carrying the test meals?
While carrying the test meals my jobs required that I: (Check appropriate
boxes)

	Most of the time	Some of the time	Very Little	None of the time
Sit				
Walk				
Run				
Ride in Vehicle				
Climb				
Dig				
Crawl				
Clean Weapon				
Use Weapon				
Snowshoe				
Ski				
Clear Trail(s) with Machete				
Prepare Firing Positions				

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6. a. Did carrying test rations interfere to any great extent with your doing your job?

Yes, a great deal

yes, some

No, did not interfere

b. If your answer is "yes", in what way did it interfere?_____

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APPENDIX - D

TEST OFFICER'S REPORT

Date _____ Test Officer _____

1. Describe the ease or difficulty of carrying the test rations in the soldier's clothing and rucksack as complete menu cartons.

(1) Clothing _____

(2) Rucksack _____

2. Describe the ease or difficulty of carrying the individual components of the test ration in the soldier's clothing and rucksack.

(1) Clothing _____

(2) Rucksack _____

3. What is the maximum number of test rations that can be carried in a soldier's clothing and rucksack?

	When carried as <u>complete menu cartons</u>	When carried as <u>individual components</u>	Combination <u>of both</u>
Clothing only	_____	_____	_____
Rucksack only	_____	_____	_____
Clothing and rucksack	_____	_____	_____

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4. What is the reasonable (optimum) number of test meals that can be carried in a soldier's clothing and rucksack and the recommended method of carrying them?

	Number of test meals	Method of carrying
Clothing only	_____	_____
Rucksack only	_____	_____
Clothing and rucksack	_____	_____

5. Comments regarding carrying of the test rations: _____

6. Did components of the test rations usually freeze when carried in (Check appropriate boxes):

	<u>Yes</u>	<u>NO</u>
a. Trouser pockets	_____	_____
b. Shirt pockets	_____	_____
c. Field jacket pockets	_____	_____
d. Parka pockets	_____	_____
e. Rucksack	_____	_____

7. Where must test rations be carried to prevent freezing of components?

8. List observations and opinions regarding durability of containers.
Portability Phase: _____

Durability Phase: _____

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9. Other comments, in general, pertaining to the suitability of the test rations for use under arctic winter conditions.

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APPENDIX - E

PACKAGING FAILURES AND EFFECTS OF FREEZING FORM

No. Meals Carried _____ Name _____
Complete Rations Cartons _____
Individual Components _____ Date _____

Name and Code Number of In- dividual Com- ponents	Location *	F** or UF	Diagram of Damage and Damage Code	Name and Code Number of In- dividual Com- ponents	Location	F** or UF	Diagram of Damage and Damage Code

*Exact location where complete ration cartons or individual components, as appropriate, were carried using the following code:

CB - Between clothing and body
TP - Trouser pockets
SP - Shirt pockets

JP - Field jacket pockets
PP - Parka pockets
RS - Rucksack

****Indicate whether components were frozen or unfrozen when removed from the clothing or rucksack by inserting "F" if frozen or "UF" if unfrozen.**

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APPENDIX - F

AIRDROP EVALUATION FORM
(Bundle Data)

Date _____ Bundle No. _____

Aircraft _____ No. Cases _____

1. Type of Delivery

a. Parachute:

b. Free-fall

High velocity

Low velocity

2. Chute Nomenclature _____

3. Method of Rigging _____

4. Altitude when dropped _____ feet.

5. Airspeed of aircraft _____ knots.

6. Wind velocity _____ .

7. Description of terrain where bundle landed: _____

8. a. General condition of bundle: Good Fair Poor

b. Sketch of bundle:

c. Comments: _____

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APPENDIX - G

AIRDROP EVALUATION FORM
(Case and Carton Data)

Date _____ Bundle No. _____

Type of Delivery _____ Case No. _____

1. Position of case in bundle: (Draw diagram)

2. Condition of case: Not damaged _____

Damaged _____

Type, description and location of damage: _____

3. Condition of individual components of test ration:

Number not damaged _____

Number damaged: _____

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APPENDIX - H

AIRDROP EVALUATION FORM
(Parachutist Data)

Name _____ Date _____

You were issued _____ test rations which you dispersed in your clothing and equipment and jumped from an altitude of _____ feet. Based on this exercise, answer the following questions.

1. Describe fully where and how test rations were dispersed in your clothing and equipment. _____

2. How adequate was the space in your clothing and equipment for dispersing and carrying _____ (number) test rations. (Circle one)

More than adequate

Adequate

Not adequate

3. a. Did carrying _____ (number) test rations restrict your movements? (Circle one)

Yes, a great deal

Yes, some

No, did not restrict movement

b. If your answer is "yes", in what way did it restrict your movements: _____

4. a. Did carrying the test rations in your clothing and equipment result in any safety hazards? Yes No

b. If answer is "yes", explain any safety hazards. _____

